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Fish Stocking Assessment Of Sabai Lake, 1999

R. J. Zemlak
December 2000

PWFWCP Report No. 230

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

Citation: R. J. Zemlak. December 2000. Fish stocking assessment of Sabai Lake, 1999. Peace/Williston Fish and Wildlife Compensation Program, Report No. 230. 12pp plus appendices.

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SABAI LAKE

WATERSHED:	Parsnip River
DATE OF SURVEY:	June 22 and 23. 1999
FIELD CREW LEADER:	Randy J. Zemlak
FIELD ASSISSTANT:	Arne R. Langston

PEACE/WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

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FISH AND WILDLIFE BRANCH

REPORT PREPARED BY: RANDY J. ZEMLAK

INTRODUCTION

Sabai Lake is located approximately 28 km south of the town of Mackenzie BC or about 12 km northwest of McLeod Lake BC (Figure 1). The lake has received some attention over the past 13 years from fish biologists with both the Ministry of Environment, Lands and Parks (MELP) and the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP). Ministry of Environment biologists first conducted a standard fisheries baseline reconnaissance level survey of Sabai Lake in 1987 in order to determine the fish species composition. The results of this survey indicated that the lake contained redside shiners and suckers (Labach 1987). A second survey was then conducted by PWFWCP biologists in 1990 (Jesson 1990). The intent of this second survey was to identify potential fisheries enhancement projects, and to identify any possible fish stocking options. These reports can be viewed at the PWFWCP office (address on cover page).

In 1991, Sabai Lake was deemed a suitable candidate for stocking with rainbow trout. This lake has never been assessed since its original stocking of rainbow trout. In 1999, the lake was targeted as a high priority for a fish stocking evaluation as part of the PWFWCP stock assessment program for the Omineca Region. As a result, in June 1999, PWFWCP fish biologists investigated this rainbow trout stocking program.

LAKE LOCATION

Location:	28 km south of Mackenzie BC
Elevation:	± 713 m
Latitude/Longitude:	50° 04' 57" : 123° 05' 37"
U.T.M.:	10.494324.6104007 (NAD 1983)
Management Unit:	7-24
N.T.S. Map No.:	93 - O/3
Watershed:	Parsnip River
Waterbody Identifier:	00027CARP
Lake Drainage:	outlet cr. ---> Tudyah L. ---> Pack R. ---> Williston Reservoir (Parsnip Reach) ---> Peace R.

ACCESS

Since 1987, road access has been documented to Sabai Lake. The two previously mentioned reports do provide directions to this lake. Since road conditions change with time, the current directions to this lake have been updated and immediately follow in this report.

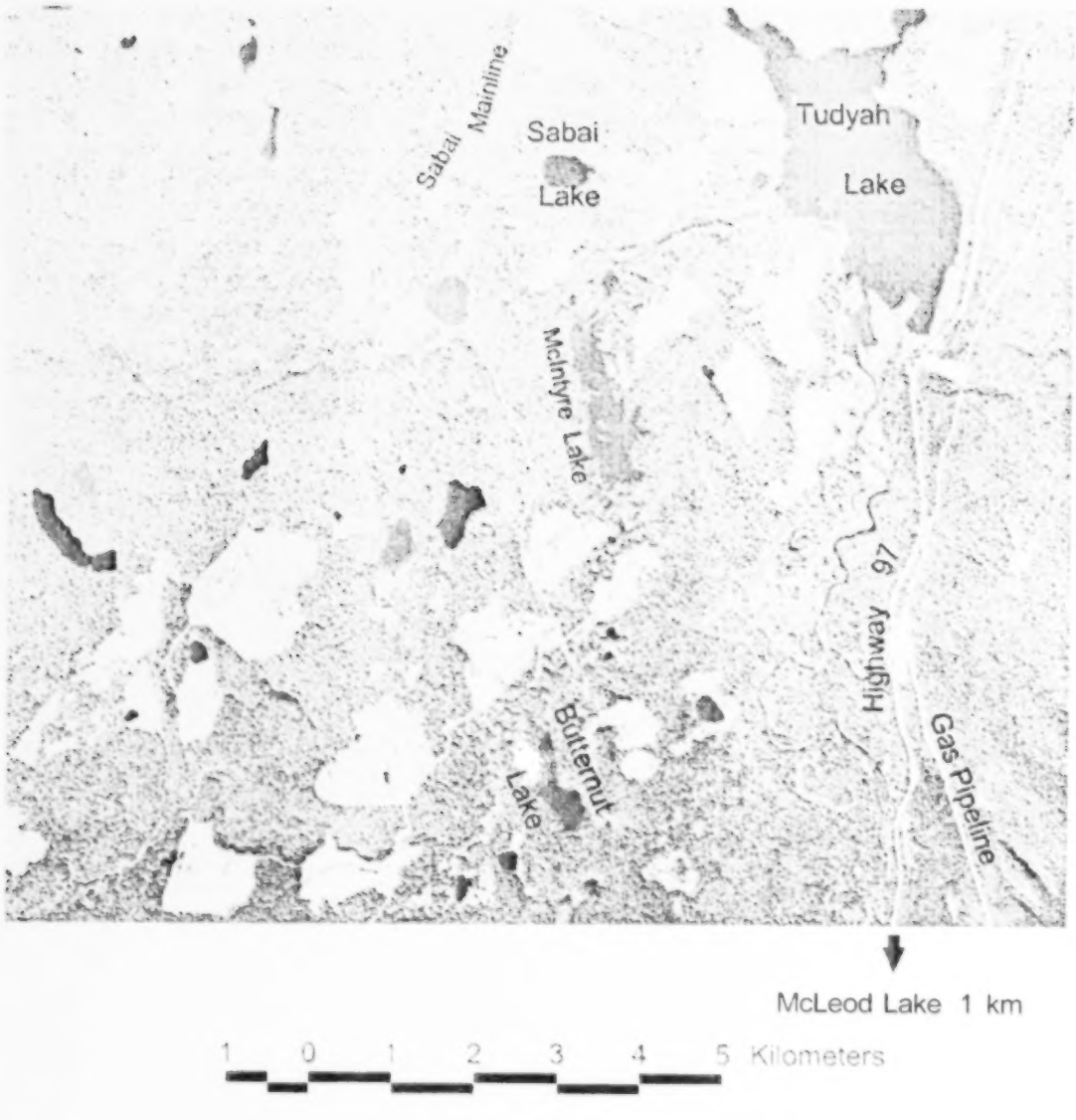

Figure 1. Location of Sabai Lake.

Figure 1. Location of Sabai Lake.

Starting at the junction of Highways 97 and 39, travel 3.0 km south on Highway 97. Turn right onto the Finlay Forest Service Road. This road is a well-used two lane (2 WD) gravel road. Stay on this road for 10.1 km (crossing the Crooked/Pack R. Bridge at km 10.0). After the bridge, turn left and travel on the Sabai Mainline road. This road is also a two-lane (2 WD) gravel road. At km 2, stay right (going left will take you to Tudyah Lake). At km 3.4, turn left (Sabai Lake Forest Recreation site sign present). Proceed another 0.8 km to Sabai Lake (single lane, 2 WD). This road ends at the northwest shoreline of the lake at a small car top boat launch site.

There is a Forest Recreation Site on the northwest shore. Four campsites are present, each with picnic tables and fire pits. In addition, there are two outhouses. Large trailers are not recommended, as the turn around site is quite narrow.

STOCKING HISTORY

Sabai Lake was first stocked in 1991 (Table 1). Stocking numbers have been consistent with approximately 5,000 yearlings stocked every year for the past nine years (a total of 45,000 fish). There have been many different types of stocks (5) introduced into Sabai Lake. The life stage of these stocks consisted of yearlings. The size range of these stocked fish has been as small as 3.7 g to as large as 12.3 g.

Table 1. Sabai Lake rainbow trout stocking history.

Year	Number	Size (g)	Life Stage	Stock
1991	5,000	6.8	Yearling	Premier
1992	5,000	8.3	Yearling	Premier
1993	5,000	3.7	Yearling	Dragon/Tunkwa
1994	5,000	11.3	Yearling	Tunkwa
1995	5,000	12.3	Yearling	Blackwater
1996	5,000	6.0	Yearling	Badger/Tunkwa
1997	5,000	9.3	Yearling	Badger/Tunkwa
1998	5,000	6.9	Yearling	Badger/Tunkwa
1999	5,000	6.3	Yearling	Badger/Tunkwa

METHODS

Three different techniques were used to determine the relative abundance of the fish species in Sabai Lake. Conversations with MELP fish biologists prior to the gill netting effort suggested that it would be valuable to have at least 10 fish sampled from each age group to accurately assess the relative size at age of fish with any statistical significance. If this amount of fish were not obtainable, then it was recommended to obtain a minimum of 30 sampled fish (all ages) from the population, but more would be preferable. Therefore, it

may have been necessary to set the gill nets overnight (if less than 30 fish were captured during the day).

A sinking monofilament experimental gill net was used to capture fish. Three netting efforts were conducted. The net consisted of six different sized mesh panels ranging from 25 to 85 mm. Each panel was 15.23 m long and 2.4 m wide. One of the net sets was conducted in the same location as in the 1990 assessment to compare the catches between years (Figure 2).

A second fish capture method used was Gee traps. Four traps were used to capture juvenile fish. Each Gee trap was baited with sardines and was set overnight. The Gee traps were placed in the same locations as in the previous survey, in shallow (< 2-m) littoral habitat.

The third technique used to capture fish was angling gear. A spin cast rod and a fly rod was utilized along with a few different lures and dry flies. Angling was mainly performed by trolling.

The rainbow trout captured were measured for fork length and weight. A biological examination of the fish was conducted which revealed its sex, maturity, stomach contents, and disease/parasite presence. Scale samples were collected for age determination and the analysis was performed by North/South Consultants (Winnipeg, Manitoba). The general appearance of the fish was determined through visual analysis. Mean fork lengths were determined for each age class of rainbow trout. Finally, condition factors ($Weight/Length^3 \times 100$) were determined for each individual fish.

All other fish species were enumerated and most fish were sampled for fork length and weight. General appearance of these fish was also observed and recorded. Some fish were examined for stomach content and sexual maturity. Any non-game fish captured that were still alive in the gill nets were released immediately and not sampled.

The habitat features of Sabai Lake were briefly examined during this assessment. The entire perimeter of the lake was observed to assess all inlet streams flowing into Sabai Lake and the outlet. The benchmark established during the original study (1990) was examined. Changes to the current water level was measured with an Abney level, 1.5 m staff, and a 30 m Eslon tape. Any new campsites and other developments identified after the survey in 1990 were also recorded. In addition, oxygen and temperature data was collected at the deepest part of the lake (approximately in the same location as in the 1990 lake survey).

On-site anglers were interviewed opportunistically and the catch per unit effort was recorded. Their catches were to be sampled in the same manner as described above. In addition, angling efforts by PWFWCP fish biologists were also recorded to determine additional catch per unit effort.

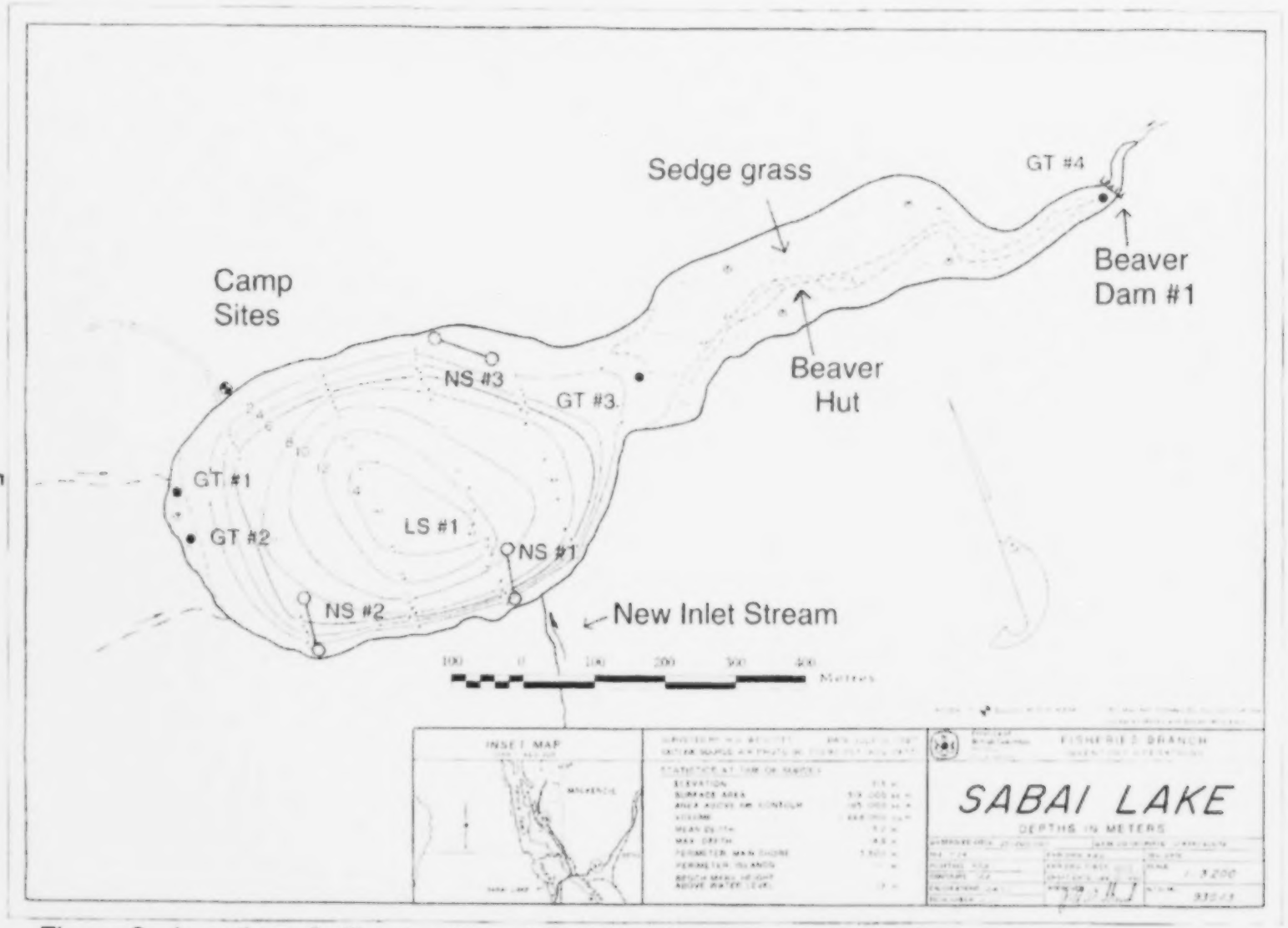

Figure 2. Location of gill net sets and Gee trap locations on Sabai Lake.

RESULTS

The total catch for rainbow trout (RB) in Sabai Lake was produced entirely by the use of gill nets. Three net sets, combined for just over 28 hours of effort, produced 18 rainbow trout (catch per unit effort is 0.64 fish per hour of netting). Four Gee traps were used for 24.8 hours and captured O rainbow trout while angling efforts also produced zero trout. Although, the angling effort was much smaller (slightly less than one hour) and these results can not be compared to the other two techniques. Other species of fish were captured by the gill nets and Gee traps (Table 2). These species include: lake chub (LKC), largescale suckers (CSU), longnose suckers (LSU), prickly sculpins (CAS), and redside shiners (RSC).

Table 2. Total catch of fish by gill netting and Gee traps.

Species	Gill Nets	Gee Traps	Total
Rainbow trout	18	0	18
Redside shiners	15	73	88
Largescale suckers	52	0	52
Longnose suckers	7	0	7
Lake chub	0	7	7
Prickly sculpins	0	5	5

Gill Nets

Three netting efforts were conducted, two on June 22 and one on June 23, 1999 (Table 3; Appendix 1). Gill net #1, set for 6.0 hours, produced 1 RB and 4 RSC. A second net was then set overnight since the first net set yielded only 1 RB. Gill net #2, set overnight for 17.67 hours, produced 12 RB, 11 RSC, 7 LSU, and 37 CSU of which 6 escaped the net. Then a third net was set. Gill net #3, set for 4.5 hours, produced 5 RB and 15 CSU. The nets were checked periodically throughout the day (every 1.5 hours) and were cleaned of all fish when there were more than 10 fish present. The nets were then re-set until enough rainbow trout were captured (ideally 50). After the third netting effort, no more gill nets were set.

Table 3. Gill net catch summary for Sabai Lake, 1999.

Date	Species	Net Site Number			Sampled	Escaped	Size Range (cm)
		1	2	3			
June 22	RB	1			1	0	11.4
June 22	RSC	4			4	0	9.0-9.5
June 23	RB		12		12	0	11.1-31.8
June 23	RSC		11		11	0	8.5-10.3
June 23	LSU		7		7	0	20.5 - 27.4
June 23	CSU		37		31	6	11.7 - 36.0
June 23	RB			5	5	0	11.5 - 28.0
June 23	CSU			15	15	0	22.5 - 23.1

Angling

On June 22, PWFWCP fish biologists angled for ¾ of an hour using two rods and caught zero rainbow trout. Catch per unit effort was O fish per rod hour. One on site angler (Vida Tattrie from Mackenzie) was present during this survey and provided some additional information on her success rate. She reported that she and her husband have been coming to Sabai Lake since 1973. During the past week of their stay, they caught approximately 10 rainbow trout using a spin cast rod with a gang troll. Although, she could not accurately report on the amount of time they angled to capture these fish. The average size of the fish was about 25 cm in length and only one fish was in spawning condition. None of these fish were available for sampling by the program biologists. She also reported that there were bigger fish (up to 1.5 kg) in Sabai Lake until 1996. These larger sized fish seemed to correspond with the existence of a beaver dam on the outlet. When the beaver dam was later breached, the result was a decrease in lake level and the size of the rainbow trout. When asked about the general angler use on the lake, she reported that anglers do not heavily use Sabai Lake.

Aging

Age analysis was conducted on all rainbow trout samples and was determined by North/South Consultants (Appendix 2). Prints of the scales and age markings were provided for each fish and reviewed by PWFWCP fish biologists. No obvious errors were detected in the aging of the scales. There were a total of 18 RB analyzed. Three age classes were present: 1, 3, and 5 year old rainbow trout. The age one fish could be from the stocking of the lake one month prior to this survey. The average length for the 3 age categories captured was 12.1 cm, 30.0 cm, and 28.0 cm respectively. The growth at each age category can not be discussed with any statistical significance, as the sample sizes of these age categories are too small. Only one 5 year old fish was captured and it happened to be slightly smaller than the average length for the 3 year old fish (n = 2).

Gee Traps

Four Gee traps were used to capture juvenile fish. The traps were set overnight (Figure 2) for approximately a 24 hour duration. Three fish species were captured by Gee traps which included redside shiners, lake chub, and prickly sculpins (Table 4). The results obtained in 1999 are somewhat similar to the Gee trapping results of 1990 on Sabai Lake. However, there were some differences between the surveys. No peamouth chub or burbot were captured in the 1999 survey. According to the 1990 study, peamouth chub were captured in the Gee traps. The author suspects that the people conducting the 1990 survey misidentified lake chub for peamouth chub. It is still possible burbot inhabit Sabai Lake. Burbot generally prefer deep water areas and can tolerate low oxygen conditions. The majority of the gill netting effort in 1999 was not in this type of habitat. The purpose of this survey was to look at the rainbow trout population, not burbot. Therefore, other capture methods would have to be implemented in order to determine the status of burbot in Sabai Lake.

Table 4. Gee trap results for Sabai Lake, 1999.

Trap No.	Hours fished	Depth (m)	Substrate	Species	Number	Size Range (mm)
1	25.5	0.8	organics	CAS	3	84-116
			Equisetum	LKC	1	71
				RSC	1	84
2	25.5	0.6	organics	CAS	2	70-95
				LKC	3	65-80
				Leech	2	
				Beetles	3	
3	24.5	0.7	solid clay	RSC	5	77-84
			Equisetum			
4	24.0	0.8	SWD and organics	RSC (some ripe females)	67	55-84
				LKC	3	60 - 70

SWD = small woody debris

BIOLOGICAL ANALYSIS OF RAINBOW TROUT

A biological analysis was conducted on few of the rainbow trout captured (Appendix 2). Only three fish (aged 3 and 5) were captured from previous stocking efforts. Reproductive organ analysis revealed that one fish was a female and the other two were males. All three fish were immature. Examination of the stomach contents indicated that these few rainbow trout are primarily preying on zooplankton. One fish did have detritus in its stomach as well. External examination indicated healthy fish while internal examination revealed some tapeworms and parasites in their body cavity.

DRAINAGE

In 1987, Sabai Lake was reported (on the bathymetric map) to have two intermittent inlet streams and one outlet stream. However, the text of this same report only mentions one inlet stream (but does not suggest where it is located). Therefore, it was interpreted by R. Zemlak that this description refers to one of two intermittent streams located on the west shoreline. In 1999, both of these streams were examined on the west shore. The northern inlet had no detectable flow while there was very little flow present in the southern inlet. Both of these inlets contain very low fish values and are basically seepage areas (bog/peat moss areas).

During the 1999 survey, the entire perimeter of the lake was observed for any other inlets and a new inlet was found. This inlet was missed on the original 1987 reconnaissance survey and the 1990 fish assessment survey. A small stream, located on the south shore (Figure 2) was flowing at the time of the survey.

The new stream was surveyed for approximately 100 m in length. At the time of the survey, only the first 75 m was usable/accessible for rainbow trout. At 75 m upstream from the mouth, a 1.1 m high waterfall was present. This waterfall is a barrier to upstream fish passage. The stream channel within this 75 m section is quite confined. The bottom substrate was composed of mainly gravel. Although a small portion of this creek is accessible to fish for spawning, the limiting factor would appear to be flow. Little flow was present at the time of this survey and an estimate of discharge could not be taken. The creek would have to be observed in late May/early June to know whether the creek could be used for spawning rainbow trout.

This newly discovered inlet appears to have had a massive rush of water flowing down it prior to this survey. The banks of the stream were steep, confined, and showed signs of a large amount of water rushing downstream recently (spring flood). The vegetation adjacent to the stream channel still had signs of water rushing over it (flood sign was approximately 1.7 m). In addition, due to the flood event, some boulders located near the mouth of the creek appeared to have been previously located upstream. It is unknown exactly what caused a large amount of water to rush down the creek. Closer observation of a recent ortho photo (Figure 2) shows this inlet originating from a small pond located about 600 m south of Sabai Lake. This pond could have had a beaver dam on it that recently breached. As a result, the small pond would have drained to some degree and its water would have rushed down the unnamed creek and into Sabai Lake. A stream survey form was filled out for this stream describing some of the habitat characteristics in more detail (Appendix 3).

The habitat characteristics of the outlet appear to be similar to those described in the 1987 survey. A partial beaver dam is still located on the outlet. Prior to 1996, this dam did control the lake level. Currently, the dam is breached but there is no detectable flow. The dam does not appear to be active. Approximately 50 m downstream from the mouth is a second beaver dam. This second dam does control the current lake level. If this second beaver dam were to breach, then the lake level would drop another 10 cm to where the first beaver dam would now control the lake level. Photos were taken of the outlet at this location and can be viewed at the PWFWCP office. The outlet stream below the second dam was briefly assessed for fish recruitment. Currently, there is no suitable spawning habitat available for rainbow trout in the outlet immediately below the lake.

SUMMER OXYGEN/TEMPERATURE DATA

During the 1987 reconnaissance survey, the oxygen and temperature of the lake was examined. At that time, there was a point (depth) at which the lake went anoxic. In 1999, the lake was examined again to see if this same anoxic trend was still in existence (Table 5). The 1987 survey location was used to keep the data consistent (Figure 2). Both surveys were performed at relatively the same time of year (within one month). A pH reading of 8.1 was taken in 1999 at the water surface, indicating that the surface water was slightly alkaline. No reading of pH was taken in 1987 to compare.

Table 5. Summer oxygen/temperature data.

Depth (m)	O^2 (mg/l) 1987	O^2 (mg/l) 1999	Temperature (°C) 1987	Temperature (°C) 1999
Surface	9.8	8.5	20.0	16.4
1.0	9.6	8.3	20.0	16.4
2.0	9.8	8.3	20.0	16.4
3.0	9.8	9.4	20.0	**14.3**
4.0	11.8	11.3	16.0	**10.7**
5.0	12.0	10.8	11.5	8.2
6.0	11.6	6.0	8.0	5.5
7.0	8.8	**1.1**	6.0	4.7
8.0	4.4	**0.6**	5.5	4.4
9.0	0.8	**0.5**	5.0	4.2
10.0	0.5	**0.3**	5.0	4.1
11.0	0.3	**0.3**	4.5	4.1
12.0	0.25	**0.3**	4.5	4.1
13.0	0.3	not taken	4.5	not taken
14.0	0.3	Bottom	4.5	bottom
15.0	bottom		bottom	

The readings between the two surveys are generally quite similar. The bottom depth difference between 1987 and 1999 is due to the breaching of the dam on the outlet and the lowering of the lake level in around 1996. There is a similar trend with the oxygen and temperature data (relative to depth). The oxygen did increase around the 4.0 m depth and then dropped significantly around the 7.0 m depth. The temperature slowly decreased with depth. These results overall do pose a problem to fish survival, especially rainbow trout. The lower lethal oxygen concentration for rainbow trout is about 3.0 mg/l (Ford et al 1995). As a result, these fish can only inhabit the upper 6.0 m of the water column. When considering the water temperature, the optimum temperature for rainbow trout growth is 10° - 14° C (Ford et al 1995). The water temperature is quite warm at 2.0 m and then drops to less than 5° C at 7.0 m. Therefore, there is a sandwiching effect where these fish will generally inhabit the lake only between the 3.0 m and 6.0 m depth (at this time of year). As a result, there is little room within the lake for these fish to seek food resources.

BENCHMARK

The benchmark (Figure 2) was re-located by PWFWCP fish biologists (6.0 m east of the boat launch access point). This benchmark was originally set in 1987 (1.7 m above the lake water level). In 1999, the water level was at 2.36 m, indicating a 66 cm drop in water level from 1987. The benchmark was then re-painted orange. This benchmark is currently located in a 35 cm D.B.H. white spruce tree, 7.5 m from shore. The high water mark on the lake was 55 cm.

FISHERIES MANAGEMENT COMMENTS

Rainbow Trout

The net catch per unit effort for rainbow trout was very poor. Gill net #1 produced 0.17 fish per hour. It appeared that the majority of the net was set in a location where there were anoxic conditions for rainbow trout (below 6.0 m). With the poor results of this first net set, it was deemed necessary to set a second net overnight (in shallower, more oxygenated water). Gill net *#2* produced 0.68 fish per hour (mainly 1 year old fish). Again, poor results were obtained (for an experimental net). With the limited spawning habitat available to fish, the yearling rainbow trout captured in both of these gill nets are assumed to be from the hatchery stocking on June 6, 1999 (one month prior to our survey). Finally, a last net set was attempted. Gill net #3 produced 0.9 fish per hour. Over 28 hours of gill netting was attempted and produced only 3 rainbow trout (excluding yearlings). With these kinds of results, it does not appear that the stocking of rainbow trout in Sabai Lake has been successful.

Limited angling efforts yielded no fish. The other people present at the lake during this survey did experience better results. It appears their results may be better due to the fact that they were present at the lake for more than one week while our angling efforts were for only about one hour.

The stocking of rainbow trout in Sabai Lake is not successful. Some of these stocked fish are not surviving for some reason. It appears that the lake has shown a trend of low oxygen levels for rainbow trout below the 7 m to 8 m depths. Very little inlet water is providing additional oxygen to the lake. This type of trend does posses a risk for stocking. In the past, when the beaver dams on the outlet were operational, there may have been just enough water (oxygen) for the stocked fish to survive throughout the year. The younger hatchery fish appear to survive. Although, once they become larger, they will have a higher oxygen demand and probably cannot survive the current low oxygen levels near the bottom of the lake for any extended time.

There is a small window of opportunity for these fish to eat (currently between the surface and 6.0 m below). The rainbow trout can not inhabit below the 6.0 m depth to eat benthic invertebrates. As a result, the fish are left with limited food resources and they cannot escape the warm surface water temperatures during the summer. The three older fish captured were reaching 30 cm in length and had adequate condition factors. The presumed few remaining fish in the lake are still finding food. As a result, the main issue with Sabai Lake appears to be the low apparent abundance, not the survival of the fish.

Other fish species

Sabai Lake also supports populations of non-game fish including largescale suckers, longnose suckers, redside shiners, lake chub, and prickly sculpins. Although not studied intensively, all of these populations seemed abundant and appear to be healthy.

In 1990, burbot were reported to inhabit the lake. The 1999 survey did not capture any burbot. Burbot generally inhabit deep/bottom type habitat. With the lake showing trends of deep anoxic conditions in the summer, it is recommended that the burbot population be examined some time in the future in Sabai Lake. Although burbot can tolerate low oxygen levels, it is difficult to determine at this point what is the status of this population.

FISH STOCKING PROGRAM

Sabai Lake is currently providing a poor recreational fishery. The abundance of rainbow trout is not adequate enough for a stocked system to create a fishery. The lake has a history of poor summer oxygen levels for rainbow trout. Many types of enhancements could take place but are not economically feasible. For example, constructing a water control device on the outlet to raise the level of the lake (thus potentially increasing the oxygen level) is not recommended due to the high costs. Aeration systems are also expensive and during the winter, there is the safety problem due to thin ice (liability issue). As a result, the author recommends that further stocking of rainbow trout into Sabai Lake be ceased and that these earmarked fish be put into a new, more suitable system.

LITERATURE CITED

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Jesson, D.A. 1990. Fish habitat enhancement potential and stocking assessment of Sabai Lake. Peace/Williston Fish and Wildlife Compensation Program Report No. 115. 12pp plus appendices.

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APPENDIX 1

Netting Record

Lake: Sabai

NETTING RECORD June 22,1999

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #1

Type:	Sinkingmonofilament gill net		
Date Set:	June 22, 1999	Time:	0940 hrs
Date Lifted:	June 22, 1999	Time:	1540 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	1.0m small gravel, cobble, SWD
Deep End Mesh Size:	64 mm	Depth: Substrate:	12.5m unknown organics ?

Comments:

Set in the same location as the first net set of the 1987 survey. Net was set and then checked at 12:05 (looked at the first three panels). Only one yearling rainbow trout and two redside shiners were present. No other fish present so it was left in to fish longer. Net was checked again at 14:45, it had 1 rainbow trout and 3 redside shiners. Left the net in again to fish. Finally pulled the net at 15:40. Gill net #1 captured 1 rainbow trout and 4 redside shiners.

The biologists noticed that the depth of the net between the third and fourth panel was 9.0 m deep. Checked the depth along the first panel. At approximately 15 m from shore, the net was in 5.0 m of depth. This observation could have explained why very little rainbow trout were being captured. The reason here could be that the net was almost entirely fishing in an area of anoxic conditions to rainbow trout. Therefore, it was deemed necessary to try netting in another location (above the 6.0 m and 7.0 m depth range).

Lake: **Sabai**

NETTING RECORD **June 23, 1999**

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #2

Type:	Sinking monofilament gill net		
Date Set:	June 22, 1999	Time:	1600 hrs
Date Lifted:	June 23, 1999	Time:	0940 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	0.8 m organics, SWD, aquatic veg.
Deep End Mesh Size:	64 mm	Depth: Substrate:	6.5 m unknown

Comments:

Net was set in an area of adequate oxygen levels for rainbow trout (above the 7.0 m depth). Net was pulled in the morning. Gill net #2 captured 12 rainbow trout, 7 longnose suckers, 37 largescale suckers (of which 6 escaped the net), and 11 redside shiners. Of the 12 rainbow trout captured, 10 fish were yearlings and only two of them were older.

Net set #2 did not get any deeper than 6.8 m (depth sounder). Net was set on the west shore.

Lake: Sabai

NETTING RECORD **June 23, 1999**

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #3

Type:	Sinking monofilament gill net		
Date Set:	June 23, 1999	Time:	0955 hrs
Date Lifted:	June 23, 1999	Time:	1435 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	1.2m *Equisetum*, SWD, organics
Deep End Mesh Size:	64 mm	Depth: Substrate:	7.3 m unknown

Comments:

Net was set in the morning on the north shore. Net was then pulled later on in the afternoon. Gill net #2 captured 5 rainbow trout (4 yearlings were released alive) and 15 largescale suckers.

After these three netting efforts, it appears that the abundance of stocked rainbow trout in Sabai Lake is poor.

APPENDIX 2

Individual Fish Data

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: June 22. 1999
Gill Net #1

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	11.4	?	?	IMM	?	1						fin rot

Also captured the following fish:

4 redside shiners
The lengths were: 90 mm, 92 mm, 95 mm, and 93 mm. No weights were taken.

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Lake: Butternut

INDIVIDUAL FISH DATA

Date Captured: June 23, 1999
Gill Net #2

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	31.8	349.2	1.0859	IMM	M	3		zoo.				T.W.
RB	26.3	197.5	1.0857	IMM	F	3	detritus	zoo.				T.W.
RB	13.1	24.4	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	12.0	19.6	n/a	IMM	?	1	Did not	examine	1	year	old	fish.
RB	11.1	16.5	n/a	IMM	?	1	Did not	examine	1	year	old	fish.
RB	12.2	20.4	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	12.2	19.0	n/a	IMM	?	1	Did not	examine	1	year	old	fish.
RB	12.8	21.3	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	11.7	19.0	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	12.3	20.2	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	12.0	19.5	n/a	IMM	F	1	Did not	examine	1	year	old	fish.
RB	12.1	30.7	n/a	IMM	F	1	Did not	examine	1	year	old	fish.

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Also captured the following fish:

11 redside shiners
average length = 92 mm
minimum length = 85 mm
maximum length = 103 mm

31 largescale suckers (plus 6 escaped the net)
average length = 240 mm
minimum length = 117 mm
maximum length = 360 mm

7 longnose suckers
average length = 220 mm
minimum length = 205 mm
maximum length = 274 mm

Lake: **Sabai**

INDIVIDUAL FISH DATA

Date Captured: June 23, 1999
Gill Net #3

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	28.0	229.4	1.0450	IMM	M	5		zoo.				detritus

Also captured the following fish:

4 yearling rainbow trout
(released alive)

average length =115 mm

15 largescale suckers

average length = 231 mm
minimum length = 225 mm
maximum length = 306 mm

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

- Average condition factor for all rainbow trout excluding age 1 fish = 1.0705 (n = 3).

AGE DETERMINATION COMPLETED BY:

North/South Consultants
Paul Graveline
2nd Floor, 1475 Chevrier Blvd.
Winnipeg, Manitoba, R3T 1Y7

APPENDIX 3

Stream Survey Form

Lake: **Sabai**

DFO / MOE
STREAM SURVEY FORM

Stream Name	gaz: None	local: Unnamed Creek			Access	V2	Method		
Watershed Code				Reach No.	1 of 3	Length km	0.1	GE	
Location	Sabai Creek on South shore of Sabai Lake from the mouth to 100m u/s.	Map#	93 G/2	Site No.	1	Elev m/ft	100	GE	
		UTM		Fish Card	Y / N	C	Field ☑	Hist ☐	
Date Y M D	99 06 22	Time	1130	Agency		Crew	RL RZ	Photo	Air Photos	BC 77093:257

C	PARAMETER	VALUE	METH	SPECIFIC DATA
	Ave.Chan.Width (m)	1.2	MS	
	Ave.Wet.Width (m)	0.9	MS	
	Ave Max Riffle Depth (cm)	5.0	MS	
	Ave Max Pool Depth (cm)	5.0	MS	
	Gradient %	1.0	SC	
	%Pool 0.5 Riffle 0.5 Run Other		GE	
	Side Chan.%		GE	
1	Debris Area%	2	GE	
	Stable %	True	GE	
	COVER Total %	10	GE	
	Comp (≥ 75% cover) Abund (25-75% cover) Occ (5-25% cover) Class (<5% cover)			
	Soft 100%	0 0 10 0 10 80		
	Crown Closure % 40	C	Aspect NW	

C	BED MATERIAL		
	Fines	silt, clay, sand (<2mm)	25
	Gravels	small (2-16mm)	30
		large (16-64mm)	20
	Larges	small cobble (64-128mm)	15
		large cobble (128-256mm)	5
		boulder (>256mm)	5
	Bedrock (R)		0
	D_{50} (cm) 15	C	Compaction L M H

C	BANKS						
	Height 0.3 m	Undercut					
3	Texture F G L R						
4	Cohesion	EN	CO	FC	OC	UC	N A
	Valley Chan/Bf Ratio	0-2	2-5	5-10	10+	N A	
	Stage	Dry	L	M	H	Flood	
4	Flood Signs H(m)		Treated	Y	N		
	Bars % 0	DP	—	Depth	—		
	Water Temp °C 14.5	Turbidity	—	Cond (µS)	—		

C	DISCHARGE			
	Parameter	Value	Meth	Specific Data
5	Wetted Width (m)			Not Taken
	Mean Depth (m)			
	Mean Velocity (m/s)			
	Discharge (m³/s)			

REACH SYMBOL
Fish

C	FISH SUMMARY					
	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref

STREAM VALLEY CROSS-SECTION
Looking Downstream

L R

PLANIMETRIC VIEW

COMMENTS

Channel Stability Debris Management Concerns Obstructions Riparian Zone Valley Wall Processes Etc

1
2
3
4
5

Recorder
Date Y M D